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USSR: Impact of Restricted US Grain Exports

An Intelligence Assessment

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March 1980

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An Intelligence Assessment

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USSR: Impact of Restricted US Grain Exports

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Executive Summary

The decision to limit US grain exports to the Soviet Union will result in withholding about 19 million tons of grain in *calendar year* 1980. Even with unrestricted US grain exports, Moscow would have needed to make some adjustments in the livestock sector this year. Present US policy will now make these adjustments larger than anticipated.

The Soviets can only partially offset the loss of US grain by additional grain purchases elsewhere, or by a combination of other actions—increased drawdowns of grain stocks that are probably at low levels already, increased imports of other feedstuffs such as soybean meal, or increased imports of meat. Additional sales (in this context, diversion) of non-US grain could amount to 5 to 9 million tons for this calendar year. Recent sales of Canadian and Argentine grain to the Soviet Union have already brought the likely diversion to the middle of this range, and further sales are possible. 25X1

Past Soviet behavior provides some guidance for estimating the possible net impact of the US embargo. If we assume average Soviet grain crops in 1980 and 1981 and a net loss in 1980 of 10 million tons due to the US controls (with diversion of 9 million tons), historical relationships within Soviet agriculture suggest a considerable impact on Moscow's livestock program. Reduction in 1980 grain supplies will probably require:

- Reductions in livestock inventories, especially of swine and poultry. Overall inventories may be down 2 to 3 percent by 1 January 1981, with about a fourth of the drop due to the shift in US grain export policy.

- A drop in meat output of about 300,000 tons (2 percent) from the 1979 level of 15.5 million tons. This estimate suggests that emergency slaughtering will offset approximately half of the potential impact of lower grain supplies on actual meat production.

Events yet to be played out could change the outlook still further. For example, the Soviets could decide to maintain livestock inventories during 1980, even in the face of reduced feed supplies. More of the impact of the US restrictions would then fall on current meat output—the decline in meat output this year would double to some 600,000 tons, or 4 percent. In addition to seeking foreign alternatives to US grain, Moscow can further mitigate the impact of the US grain embargo by importing concentrated feeds, especially soybeans and soybean meal and meat. Additional imports of soybeans and

soybean meal are not likely to provide much of an offset because of limited Soviet handling and processing facilities and inexperience with large-scale use of protein meal feed. World meat supplies are tight now so the Soviets will have to pay substantially higher prices to secure quantities greater than last year's meat imports. In any case, Soviet intentions on the imports of meat, soybeans, and soybean meal are still unclear.

USSR: Impact of Restricted US Grain Exports

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Overview

The decision to limit US grain exports to the Soviet Union will result in withholding about 19 million tons of grain in *calendar year* 1980.[1] The Soviets can only partially offset the loss of US grain by additional grain purchases elsewhere, or by a combination of other actions—increased drawdowns of grain stocks that are probably at low levels already,[2] increased imports of other feedstuffs such as soybean meal, or increased imports of meat.

We now see the shift in US policy causing a grain deficit of at least 10 million tons this year, with a consequent reduction in the Soviet livestock program. Both meat production and livestock herds are likely to decline 2 to 3 percent in 1980. These results will contrast sharply with the leadership's earlier intention to contain the impact of the poor 1979 grain harvest through record grain imports.

The present Soviet leadership has had a longstanding and well-publicized commitment to improve the plight of the Soviet consumer. Much of this effort has focused on improvements in the diet, and expanded meat production has been the cornerstone of this program. Despite a substantial expansion in meat production during the first half of the 1970s, demand has consistently outstripped supply and shortages are chronic. Paradoxically, the growing gap between consumer demand for meat and meat supply has been encouraged by Soviet policies that price meat at artificially low levels, increase disposable income steadily, and limit the availability of other consumer goods that could absorb discretionary spending.

Much of the improvement in the livestock program during the last decade came as a result of a policy decision to expand greatly grain imports in years of grain shortfall rather than to cut herds. Such imports served to cushion the impact of domestic harvest failures as well as to raise the general capacity of the agricultural sector to support increased output of animal products.

[1] Unless otherwise indicated, calendar years are used in this report.

[2] No figures on grain stocks held have ever been released by the Soviets. Indirect estimates suggest that stocks cannot sustain a drawdown this year much above that projected before the US embargo.

The US decision to restrict grain exports comes at a time when the Soviets are again particularly dependent upon grain imports to support livestock feeding, which accounts for about half of all grain used. The 1979 Soviet grain crop of 179 million tons was the smallest since 1975—48 million tons below plan and 58 million below the record 1978 crop. Moscow was able to maintain livestock herds in 1979 only through record grain imports. Even with unrestricted US grain exports, Soviet port capacity constraints would not have allowed sufficient imports in 1980 to prevent some adjustments in the livestock sector. Present US policy will now make these adjustments larger than anticipated.

In late 1979, we expected Soviet grain imports in calendar 1980 to be 38 million tons, given an average (trendline) grain crop this year. Of the total, the United States probably would have furnished 25 million tons. Under a partial US embargo of indefinite duration and continuation of the US-USSR Long-Term Agreement (LTA) on grain purchases, US exports to the Soviet Union now would be limited to 8 million tons in each LTA year (October/September). Because of heavy shipments during the fourth quarter 1979, we would expect allowable US deliveries during calendar year 1980 to be about 6 million tons; that is, the amount of US grain withheld would be roughly 19 million tons in 1980.

Moscow has moved to replace some of the denied US grain by increased imports from other sources. Additional sales (that is, diversion) of non-US grain could amount to 5 to 9 million tons for this calendar year. We characterize 9 million tons of diversion as a "high" scenario and 5 million tons as a "low" scenario. Recent sales of Canadian and Argentine grain to the Soviet Union have already brought the likely diversion to the middle of this range, and further sales are possible. Total Soviet grain imports for the year thus should approach 28 million tons, or a probable net loss of at least 10 million tons. [redacted]

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The denial of 19 million tons of US grain this year—without offsets—would lead to a loss of as much as 1.4 million tons in Soviet meat production *capacity,* defined as the meat equivalent of the liveweight of existing herds. This loss equals about 9 percent of meat output. A diversion of 9 million tons of foreign grain to offset some of the loss of US grain in 1980 reduces this capacity loss to about 5 percent. Actual meat *marketings* in 1980 could be prevented from falling as much as this through increased slaughter of livestock herds—with a resulting fall in total weight of the livestock inventory—and by distributing the feed deficit among all animal products, not just meat. To the extent that Moscow takes such actions, the net impact of the denied US grain on meat production this year will be less than the loss in meat production capacity would suggest.

The impact of reduced grain availability on meat production and livestock herds will depend in part upon Soviet policy decisions yet to be made. Winter and spring growing conditions and the prospects for both grain and nongrain feed crops in 1980 undoubtedly will be important factors to be weighed by the leadership. Uncertainties in 1980 crop prospects, Moscow's flexibility in determining the 1980 balance between livestock herds and meat production, and choices to be made on distributing the grain shortfall between meat production and nonmeat animal products make projections of 1980 performance in the livestock sector very hazardous at this point.

Past Soviet behavior provides some guidance for estimating possible net impact of the US embargo, although the behavior was of course carried out under circumstances which differ in important ways from those that now exist. If we assume average Soviet grain crops in 1980 and 1981 and a net loss of 10 million tons due to the US controls (with diversion of 9 million tons), historical relationships within Soviet agriculture suggest a considerable impact on Moscow's livestock program (table 1):

- Coming on top of the poor harvest of nongrain feed crops in 1979, the US actions will cause the supply of grain used for feed in the USSR to decline about 12 percent, compared with a 4 percent decline if there were no US controls.

- Since grain accounts for almost a third of total animal feed, the reduction in 1980 grain supplies will require lower feeding rates and most probably reductions in livestock inventories, especially of swine and poultry. Overall inventories may be down 2 to 3 percent by 1 January 1981, with about a fourth of the drop due to the shift in US grain export policy. Because grain is the dominant component of their feed rations, swine and poultry would absorb most of this adjustment and swine inventories could fall up to 10 percent during the year.

- We would have expected meat production to be flat this year, even with full US exports, as the effects of the poor 1979 grain crop worked their way through feed supplies. We now expect a drop in meat output of about 300,000 tons (2 percent) from the 1979 level of 15.5 million tons. Both the pre- and post-US controls estimates assume a normal grain crop (based on the long-term trend) of 220 million tons in 1980. This estimate suggests that emergency slaughtering will offset approximately half of the potential impact on actual meat output from the decline in meat production capacity due to reduced feed rations.[3]

[3] These impact calculations imply that meat output would fall by about 40,000 tons with each 1-million-ton reduction in grain fed to livestock. This figure is less than feeding norms would indicate because compensating movements in the size of livestock herds provide a partial offset to the impact of lower feed supplies on meat marketings.

- On a per capita basis, the slump in meat production between 1978 and 1980 would amount to 4 percent and would return average meat consumption almost to the levels of the early 1970s. About two-thirds of this drop would be attributable to restrictions on US exports.

This picture of the impact of the US grain embargo is consistent with both the general pattern of past Soviet behavior and our present expectations about this year. Events yet to be played out, however, could change the outlook substantially. In particular:

- The Soviets could decide to maintain livestock inventories during 1980, even in the face of reduced feed supplies. More of the impact of the US restrictions would then fall on current meat output—the decline in meat output this year would double to some 600,000 tons, or 4 percent. The remaining impact would be reflected in the lighter average weight of the livestock herds, which, however, could be regained as normal feed supplies returned, leading to a recovery of meat output.

- Historically, output of nonmeat products (primarily milk) has not shown the same sharp fluctuations as that of meat during temporary periods of grain shortages. Our basic estimates assume that meat production absorbs the full impact of the embargo. Moscow could instead choose to distribute the grain shortfall between meat and nonmeat animal products. If the impact is spread in a proportional way among meat and nonmeat products and the historical pattern of herd reduction is followed, meat output in 1980 would be around 200,000 tons higher than otherwise—perhaps near 15.4 million tons.

- If the Soviet grain shortfall due to the US restrictions were higher than 10 million tons—say, 14 million tons—because of lower diversion, the decline in Soviet meat output in 1980 would be proportionately larger—about a half million tons or 3 percent.

In addition to seeking foreign alternatives to US grain, Moscow can further mitigate the impact of the US grain embargo by importing concentrated feeds, especially soybeans and soybean meal, and meat. In the case of soybeans and soybean meal, the limitations on Soviet handling and processing facilities and inexperience with large-scale use of such feeds do not indicate an ability to use large amounts of additional imports. As for the possibility of increasing meat imports, world supplies are tight so that the Soviets will have to pay substantially higher prices to secure quantities greater than last year's meat imports. Larger amounts require bidding supplies away from traditional importers with the attendant heavy premiums involved. In any case, Soviet intentions on the imports of meat, soybeans, and soybean meal are still unclear.

In sum, our analysis suggests that the new US policy on grain exports could impose substantial penalities in terms of both forced reductions in livestock inventories and lower meat production this year. How far inventories and production will actually fall will depend heavily, however, upon (a) the size of the 1980 Soviet harvests of grain and nongrain feed crops, (b) what Moscow decides to do about livestock inventories as feed supplies become tighter, and (c) the success the Soviets have in obtaining substitute supplies—non-US origin grain, soybeans, or soybean meal—for the embargoed US grain.

Table 1

Million Metric Tons

USSR: Impact of Restricted US Grain Exports on Soviet Meat Production in 1980

	Grain Imports		Implied Deficit in Grain Used for Feed, Calendar Year 1980 [3]	Projected 1980 Meat Output		Net Impact of Embargo on Meat Output	
	Calendar Year 1980 [1]	Fourth LTA Year [2]		Full Burden [4]	Shared Burden [5]	Full Burden [4]	Shared Burden [5]
Preembargo	38	36	0	15.6			
High diversion	28	27	10	15.2	15.4	−0.4	−0.2
Low diversion	24	23	14	15.1	15.3	−0.5	−0.3
Minimum diversion	20	19	18	14.9	15.1	−0.7	−0.5

[1] Includes 3 million tons imported for client states.
[2] Excludes imports for client states; the fourth long-term agreement year under the US-USSR pact runs from 1 October 1979 to 30 September 1980.
[3] This is the net deficit created by restrictions on US exports and does not relate to grain feeding deficits that might arise from other factors. It does include some offsetting increases in deliveries from non-US sources.
[4] The full feed deficit created by the US embargo is absorbed in meat production. This is the condition most consistent with past Soviet behavior when faced with short-term grain deficits.
[5] The feed deficit created by the US embargo is assumed to be shared by meat and nonmeat products in a proportional manner based on the average pattern of feed use.

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USSR: Impact of Restricted US Grain Exports

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Background

The present Soviet leadership has had a longstanding and well-publicized commitment to improve the diet of the Soviet consumer, and expanded meat production has been the cornerstone of this program (see appendix E). Impressive gains were made in the first half of the 1970s, when per capita meat production rose about 16 percent. The record since then has been uneven. Much of the difficulty over the last five years has reflected instability in domestic harvests of feed crops and subsequently inability to maintain steady growth of the livestock sector. In 1978, per capita consumption of meat in the USSR was only 70 percent of that in Hungary and Poland, 60 percent of that in Czechoslovakia and around 40 percent of that in the United States.

Problems in Moscow's meat program go beyond issues strictly of production. Demand for meat has consistently outstripped supply and the gap is continually growing. This phenomenon has deep-seated causes. One is the traditional Soviet policy of pricing retail meat products at artificially low levels. Another is the steady rise in disposable income. A third is the absence of competitive uses of discretionary income because of the inadequate supplies and poor quality of consumer goods in the Soviet Union. Together these factors encourage a high demand for meat which even the ambitious Soviet plans would be unable to satisfy.

The progress Moscow has made in this area has come as a result of massive infusions of investment—capital goods and fertilizers—into the agricultural sector to improve both the production of feed and the output of livestock products. Despite the heavy commitment of domestic resources, imports of grain have played a crucial role. Large imports of grain, primarily from the United States, were critical in limiting the impacts on the output of livestock products of the poor harvests in 1972 and 1975.

The US decision to restrict grain exports to the Soviet Union comes at a time when the Soviets are again particularly dependent upon grain imports. The 1979 Soviet grain crop of 179 million tons was the smallest since 1975—48 million tons below plan and 58 million tons below the record 1978 crop. In order to maintain the momentum of its very important livestock program, which now uses about half the grain produced, Moscow made a major commitment to increase greatly 1979 and 1980 grain imports. The United States benefited as the primary world grain supplier.

In December, we had expected Moscow to import about 38 million tons of grain in calendar year 1980 and 39 million tons for the US-USSR Long Term Agreement (LTA) year ending in September if the 1980 grain crop was on trend at around 220 million tons.[4] This was based on estimated 1980 deliveries of 25 million tons from the United States and 13 million tons from other sources (26 million tons from the United States and 13 million tons from other exporters for the LTA year). 25X1

The US export restrictions announced recently limit total grain shipments to the USSR to 8 million tons annually (October to September) under the LTA on grain purchases. Nearly 6 million tons of US-origin grain were shipped to the USSR during October-December 1979, 5 million tons of which were purchased under the present LTA year and the remainder under the previous year. The present restrictions imply, therefore, that no more than 3 million tons of

[4] The terms average grain crop and trend grain crop are used synonymously in this paper to describe harvests reflecting the trend in all grain yield per hectare of sown area over the last 18 years (1962-79). A trend is defined, not observed. As such, there is always a degree of judgment involved in arriving at trend data. We have defined trend yield based upon all grain production net of waste and losses (see appendix B). Our trend grain production is computed from the product of the time trend of all grain yield and sown area, to which we add an 11-percent adjustment, the average amount of waste and losses. Other methodologies will yield somewhat different trend grain output series.

Table 2

Million metric tons

USSR: Alternative Grain Import Estimates [1]

	1979 4th Qtr	1980 1st Qtr 3rd Qtr	1980 4th Qtr [2]	1980 Total	Post-1980 Annual Total [3]
I. Expectations prior to US restrictions (39 million tons for Fourth LTA year) [4]					
US origin	6	20	5	25	NA
Non-US origin	3	10	3	13	NA
Total	9	30	8	38	25-32
II. Availability under restricted US exports and 9 million ton 1980 diversion (30 million tons total for Fourth LTA year) [4]					
US origin	6	3	3	6	8
Non-US origin	3	18	4	22	20
Total	9	21	7	28	28

[1] These figures include Soviet imports of grain and flour for client states—such as Cuba, Vietnam, and North Korea—that total about 3 million tons annually. Because of delays in shipment, quantities actually imported in a given period do not necessarily agree with quantities purchased for that period.

[2] The figures for Alternative I assume grain imports at near the handling capacity of Soviet ports, because of the high priority of the Soviet livestock program and the recurrent need to provide for winter feeding of herds. For Alternative II, the figure of 3 million tons for grain originating in the US assumes a US policy to spread deliveries over the LTA year, as permitted in the Agreement. Expected heavy imports of non-US grain in the first three quarters of 1980 will reduce availability of such grain in the last quarter. Thus, although the figure of 4 million tons for the quarter is higher than expected before the US suspension of grain sales, it is lower than the quarterly average of our post-1980 estimate.

[3] For years after 1980, we have assumed average (trendline) Soviet grain crops. Also, no attempt was made to estimate imports by origin prior to the US embargo (Alternative I). In any event, non-US grain crops fluctuate more than US crops, and this makes projections of non-US grain availability highly speculative beyond 1980. Under Alternative II, the figure of 20 million tons for non-US imports assumes average crops and a restructuring of grain trade given continuation of the US policy to restrict exports.

[4] The Fourth LTA year, running from October 1, 1979 through September 30, 1980, covers fourth quarter and first through third quarter of 1980.

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US grain can be shipped to the Soviets during January-September 1980.[5]

Moscow has moved to replace some of the denied US grain by increased imports from other sources. Diversion of grain to the Soviet Union could amount to 5 to 9 million tons this year. Recent sales of Canadian and Argentine grain to the USSR have already brought the likely diversion to the middle of this range, and further sales are possibl[redacted]

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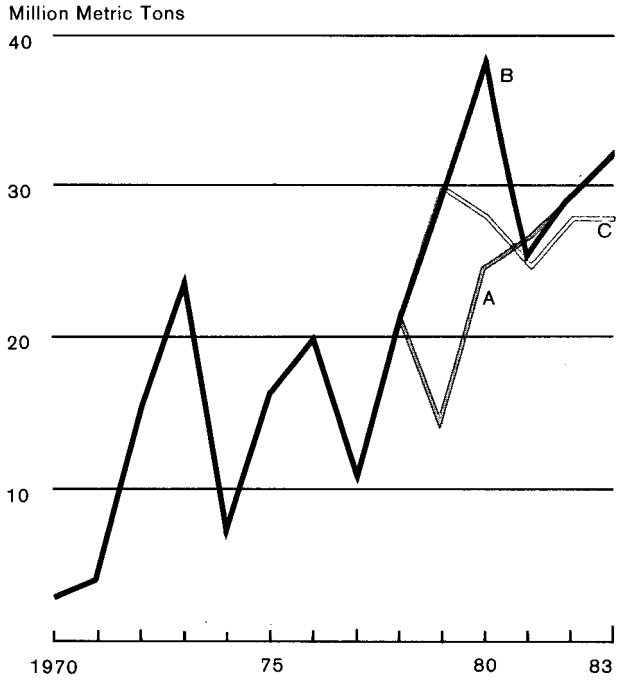
The structure of estimated Soviet grain imports (a) before the US restrictions and (b) with US restrictions and assuming a 9 million ton diversion this year are compared in table 2. It shows that Moscow will probably increase imports from other sources this year to about 22 million tons. Availability after 1980 is now projected at 28 million tons annually—8 million tons from the United States and the rest from non-US sources. Future non-US imports are particularly dependent upon the sizes of grain crops in other exporting countries, which tend to fluctuate much more than US crops. The figure of 20 million tons reflects average crops, but eventual quantities could vary widely around this number. The increase in non-US origin Soviet grain imports comes primarily from a restructuring of trading patterns, including swapping of contract destinations in the near term. All of this increase—9 million tons—represents an offset to the denied US grain.

Alternative import profiles for 1979-83 are compared with historical trends in figure 1. Case A in figure 1 is a hypothetical reference situation showing a projection of Soviet imports if the grain crops in 1979 and succeeding years were on trend. Case B is the estimate prior to the shift in US policy of Soviet imports associated with the actual 1979 crop of 179 million tons and assuming trend crops thereafter. Case C is the projection based upon a continued restriction of US

[5] Even though an additional 3 million tons could be shipped after 4 January under the US embargo, the International Longshoremen's Association (ILA)—which controls East Coast and Gulf ports—has announced it will refuse to load grain destined for the USSR. In fact, under injunction, a small quantity has already moved out through the Gulf. Since the West Coast longshoremen's union has not yet agreed to the ILA ban, some of the grain is also moving through West Coast ports. Our assumption that 3 million tons will be shipped during the remainder of the current LTA year is the best case from the Soviet standpoint.

Figure 1

USSR: Grain Imports[1]



Case A—Reference case with 1979 grain crop on trend
Case B—Poor 1979 grain crop and full US exports
Case C—Restricted US exports in 1980–83

[1] Values for 1970–78 are historical data; those for 1979–83 are estimates. All data are given in Appendix D.

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imports under the present LTA conditions[6]—a maximum of 8 million tons a year—and assuming maximum additional imports of non-US grain of 22 million tons in 1980 and 20 million tons annually during 1981-83. Postembargo import availability in 1981 looks close to required levels before the shift in US export policy. Imports at these rates, however, will be below

[6] We are now in the fourth year of the LTA ending 30 September 1981. Under Case C we assume a renewal of the LTA beyond its scheduled five years and a continuation of the 8-million-ton limit on US exports to the USSR.

the levels needed to rebuild livestock inventories rapidly unless the 1980 grain crop is near the record 1978 harvest. In any event, grain imports would be substantially short of trend requirements by 1983. Actual grain imports in 1979 (shown in Cases B and C) were much higher than expected given past Soviet reactions to a grain crop shortfall. The extra 1979 imports were a reflection of both a strong Soviet balance-of-payments situation and an unusual leadership commitment to use maximum grain imports to contain the impact of the poor domestic crop.

In the analysis that follows, we examine the potential impact of these shifts in grain imports on the Soviet livestock program. It must be emphasized, however, that these estimates are subject to considerable uncertainty, both because of severe data limitations and because of the assumptions which must be made concerning Soviet policy decisions. We use an econometric model of the Soviet agricultural sector (see appendix A) to compute rough estimates of reduced performance based on lower imports and assuming a return to average grain harvests after 1979. Given the inherent uncertainties underlying these estimates, we also look at possible changes in our 1980 meat output projections associated with shifts in our assumptions about the extent of diversion, Soviet management of livestock inventories in the face of feed shortages, and Moscow's allocation of the grain shortfall among animal products. A final case is included to suggest the maximum possible embargo impact if Soviet grain imports from non-US sources were limited to preembargo levels. A concluding section in this report summarizes the possibilities for embargo offsets from increased imports of soybeans, soybean meal, and meat. In all cases, the analysis that follows is based on past Soviet behavior and historical relationships within Soviet agriculture.

Impact of Restricted Grain Imports on the Soviet Livestock Program

Impact on Feed and Livestock Inventories

Roughly half of Soviet grain supplies are used to feed livestock, with grain accounting for about a third of total animal feed (see appendix B). It is not surprising then that a shortfall in grain has a major impact on feed availability and livestock output. Our estimate of grain used for feed in 1979 is up by roughly 11 million tons from 1978 as a result of record grain imports and the bumper 1978 grain crop. In fact, these combined factors appear to have allowed Soviet use of grain for feed in 1979 to exceed slightly the trend level expected with an average 1979 crop. Since the harvest of nongrain feed crops in 1979 was also down considerably (see appendix C), this suggests the possibility at least that the Soviets used grain to substitute somewhat for short supplies of nongrain feed in 1979. With full US exports and a return to average weather, grain feeding still would have fallen in 1980 to slightly below the 1979 level as the full impact of the poor 1979 grain harvest worked its way into feed supplies.[7] We now expect a much steeper downturn due to the roughly 10-million-ton deficit associated with the US restriction of grain exports. US restrictions would not prevent an approximate return to trend feed levels in 1981. If future harvests follow trend, however, continued US restrictions would create a permanent and growing gap between trend feed use and available grain for feed in later years.

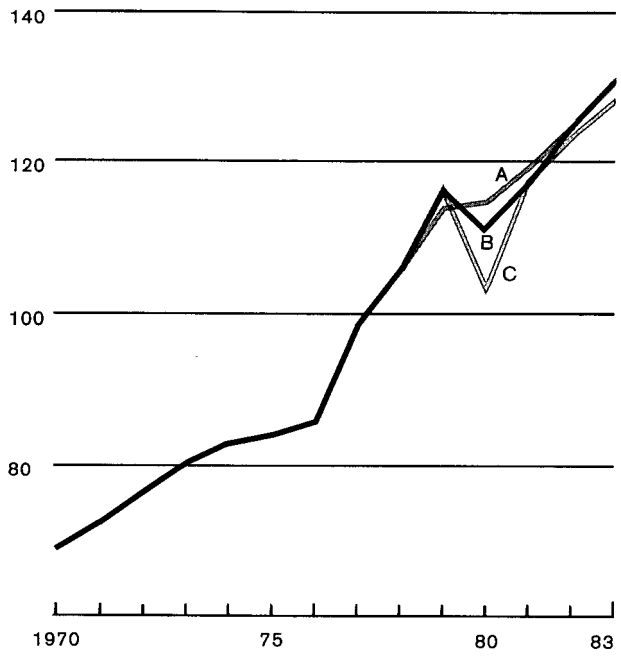
Shifts in feed supplies are usually accompanied by compensating shifts in herd size. Record imports allowed the Soviets to increase total livestock inventories in 1979, something Moscow was unable to do following the poor grain crop in 1972 and the disastrous crop in 1975.[8] In fact, preliminary 1 January 1980 figures show that, despite a bad crop, Moscow raised inventories by an amount roughly equal to our herd projection based on an average 1979 crop, confirming an unusual policy commitment in these areas. With an average grain crop in 1980, even massive imports would not have prevented some downward herd adjustments this year, although not on the scale following the 1975 crop disaster. We estimate that if past practices are followed the size of overall herds now would be down somewhat less than 3 percent

[8] During 1972-73, aggregate livestock inventories were roughly flat, as small declines in hogs and poultry were offset by increases in cattle. The 1975-76 drop after the disastrous crop in 1975 was about 4 percent.

[7] These calculations are based on an average grain crop in 1980 of around 220 million tons. It is obviously too early to speculate on the size of the grain harvest this year, but the near record plantings last fall coupled with below-average winter kill suggest a somewhat more optimistic outlook for the winter grain crop in 1980 than at this time last year.

Figure 2

USSR: Grain Used for Feed[1]

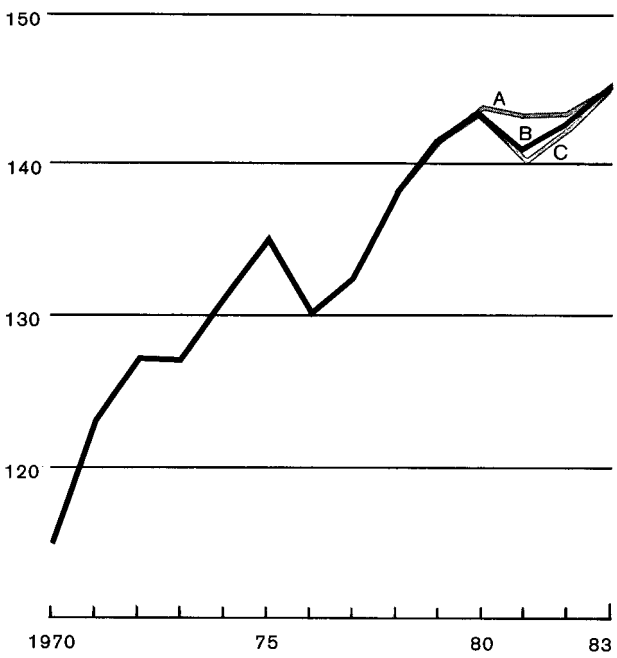


Case A—Reference case with 1979 grain crop on trend
Case B—Poor 1979 grain crop and full US exports
Case C—Restricted US exports in 1980–83

[1]Values for 1970–78 are historical data; those for 1979–83 are estimates. All data are given in Appendix D.

Figure 3

USSR: Livestock Inventory[1]



Case A—Reference case with 1979 grain crop on trend
Case B—Poor 1979 grain crop and full US exports
Case C—Restricted US exports in 1980–83

[1]Measured as of 1 January. Values for 1970–78 are historical data; those for 1979–83 are estimates. All data are given in Appendix D.

[2]In terms of cow equivalents. Livestock categories and poultry are aggregated based on relative feeding rates.

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by 1 January 1981, a fourth of this drop associated with the shift in US grain export policy, [9] and that recovery to the preembargo peak would take several years.

The bulk of short-term adjustments in livestock inventories is typically absorbed in the swine population.[10] Although breeding sows comprise only 6 percent of hog inventories and cows 38 percent of cattle, the

[9] Since the shift in US grain export policy was announced well into the winter feeding period, Moscow's policy choices regarding herd adjustments are now more complicated than usual. Much of the savings in feed that would have been made possible by distress slaughter in the fall has been lost. At the same time, a decision to hold a maximum number of livestock into the spring would expose Moscow to the possibility of a major agricultural disaster—large-scale slaughter of lightweight animals—if spring and summer feed availabilities from pasture, early forage crops, and June-July grain harvests in the Southern regions are considerably below average. Our basic projections reflect a normal, conservative approach by the Soviets to this dilemma—some increased slaughter now even though the feed savings and meat gain are limited so as to reduce the exposure to the consequences of poor grain and nongrain feed supplies during the first half of the year. This also recognizes that the worst crop shortfalls last year were in the areas of heaviest concentration of Soviet livestock—the Baltic Republics, the Western Russian Soviet Federated Socialist Republic and the Ukraine—which accentuates the feed distribution problem with an overburdened transport system and makes some herd reductions likely.

[10] Over the period 1960-78, the coefficient of variation in pork output was 11.3 percent while that for beef was only 4.5 percent.

large sow litters (8 to 10) and much shorter gestation periods allow more flexibility in management of hog inventories.[11] Consequently we expect most of the reduction this year will be in the heavier grain consuming categories of hogs and also poultry.[12] A rough calculation suggests that if the full herd reduction were in terms of hogs—a drop of around 10 percent—it would still be short of the scale of the wholesale distress slaughter of hogs in the aftermath of the 1975 crop failure.[13]

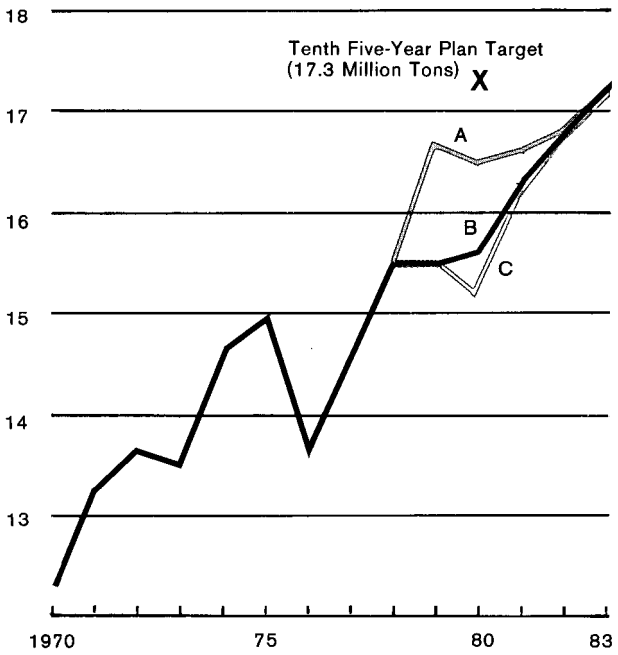
Impact on Meat Production

The estimated denial of 19 million tons of US grain this year would mean a loss of as much as 1.4 million tons in meat production *capacity* for Moscow—about 9 percent of 1979 output. A diversion of 9 million tons this year will reduce this capacity loss to around three-quarters of a million tons or 5 percent. The impact of this loss in capacity to produce meat on actual meat *marketings* of output in 1980 can be partially offset by increased slaughter of livestock herds.

Actual meat output must reflect then both herd management and feed rates. Despite an apparent record high level of grain feeding, meat output was flat in 1979. This failure in meat output to rise last year appeared to reflect (a) a Soviet commitment to maintain—and even increase—herds and (b) the need to raise the proportion of grain in overall feed rations. This above normal use of grain followed from (a) an unusual shortage of nongrain feeds in the first half of 1979 (especially in Belorussia and the Baltic Republics and contiguous areas in the Russian Republic), and (b) the sharp reduction in May-June pasturage and output of other fodder crops in European Russia because of early season drought [14] (see appendix C). If the Soviets had instead reduced herds—as we would have expected looking at past reactions to a grain shortfall—

Figure 4

USSR: Meat Production



Case A—Reference case with 1979 grain crop on trend
Case B—Poor 1979 grain crop and full US exports
Case C—Restricted US exports in 1980–83

[1]Values for 1970–78 are historical data; those for 1979–83 are estimates. All data are given in Appendix D.

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[11] Shares based on average 1 January inventory of herds.

[12] Grain and other concentrates contribute about three-fourths of hog and nine-tenths of poultry feed rations in the USSR. On the other hand, only one-third of cattle feed rations comes from concentrates.

[13] Hog inventories on 1 January 1976 were down 20 percent from the previous January.

[14] The apparent difficulties with fodder crops in 1979 are supported by two further pieces of evidence. One is the fall data on procurement of fodder crops by the socialized sector, which showed about a 10 percent drop from 1978. The other is the need to adjust downward the projection of nongrain feeding in 1979 that follows from our econometric model. This projection is based upon a historical correlation between grain and nongrain feeding rates. The statistical relations in our model yielded 1979 feed levels that would have led to somewhat greater meat production than was reported. A slight downward adjustment in nongrain feed supplies estimated for 1979—a movement consistent with collateral evidence of the severe damage to nongrain feed crops in several important livestock regions—was sufficient to eliminate this inconsistency.

meat output would have been higher than otherwise in 1979. Meat production in 1979 and Soviet behavior on grain imports paint a picture of a strong commitment to maintain the thrust of the livestock program in the face of poor grain and nongrain feed harvests last year.

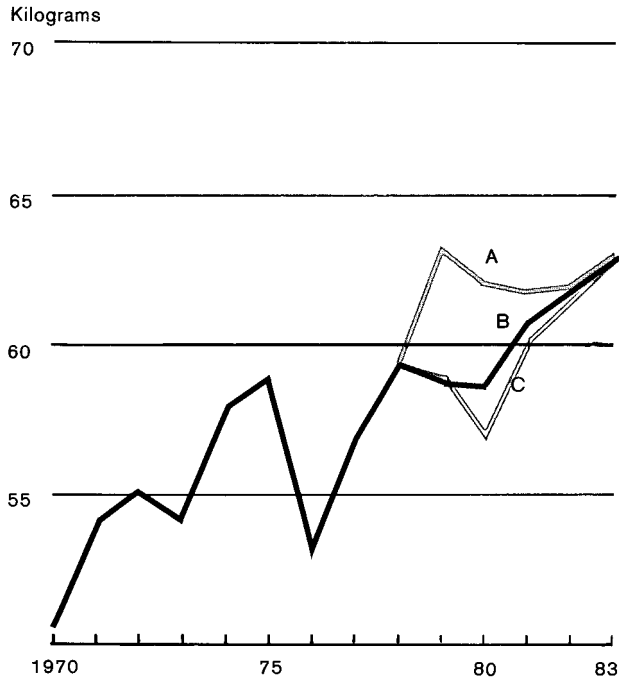
Based on past Soviet behavior patterns, herds in 1980 would probably have been cut even in the absence of the US embargo and the increased slaughter would have led to a one-time increase in meat production. Consequently, without the embargo meat output would have been about flat in 1980, despite reduced feed supplies. The embargo will probably now increase the rate of distress slaughter and therefore meat available from this source, as the Soviets are forced to reconcile demand for feed with a lower supply. This impact, however, is likely to be more than offset by lower average slaughter weights caused by reduced feed rations and increased slaughter of young animals.

If meat production bears the full burden of adjustment to lower grain supplies and nonmeat products are not cut back, we estimate that the combined effects of decreased feed rations and increased slaughter rates could result in a reduction in actual meat output of around 300,000 tons this year—all of this drop due to the embargo. About half of the lost meat production capacity is likely to show up in reduced meat marketings in 1980 and the other half implicitly in lower weight of the livestock inventory.[15] If the 1979 grain crop had been on trend (our reference case), we would have projected meat output this year at around 16.5 million tons. With the poor crop last year and US restrictions, we estimate that 1980 meat output will be down from earlier expectations for this year by about 1.3 million tons or 8 percent, with the embargo accounting for about 30 percent of this difference and the 1979 grain crop failure about 70 percent.

[15] The change in meat production capacity would be distributed between the liveweight of the livestock inventory and actual meat marketed by a policy decision. Our analysis of historical data yields a rough rule of thumb that says about half of the lost meat production capacity shows up in lower marketings and half in lower weight of the livestock inventory. Of course, since this split of the lost meat production capacity between liveweight inventory and marketings is a policy choice, Moscow could choose to follow a different pattern in 1980. Thus a sizable uncertainty regarding eventual 1980 meat production is associated with this factor alone.

Figure 5

USSR: Per Capita Meat Production[1]



Case A—Reference case with 1979 grain crop on trend
Case B—Poor 1979 grain crop and full US exports
Case C—Restricted US exports in 1980–83

[1] Values for 1970–78 are historical data; those for 1979–83 are estimates. All data are given in Appendix D.

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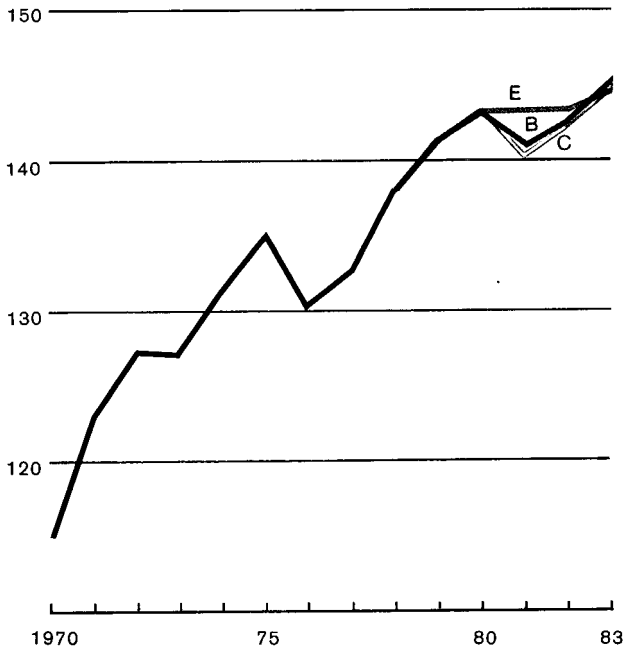
This means a falloff in meat production per capita between 1978 and 1980 of around 4 percent, which is exceeded over the last 10 years only by the precipitous decline caused by the 1975 crop disaster. The per capita production we now expect for 1980 is about 13 percent short of the target in the 10th Five-Year Plan. Moreover, instead of the 10 percent gain over 1975 projected by the plan, we now see a 3 percent fall on a per capita basis.

Figure 6
USSR: Livestock Inventory With No 1980 Herd Reduction[1]



Case B—Poor 1979 grain crop and full US exports
Case C—Restricted US exports in 1980-83
Case E—No 1980 herd reduction and restricted US exports

[1] Measured as of 1 January. Values for 1970-78 are historical data; those for 1979-83 are estimates. All data are given in Appendix D.

[2] In terms of cow equivalents. Livestock categories and poultry are aggregated based on relative feeding rates.

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Even with continued US restrictions on grain exports, a return to average weather in 1980 and beyond would rapidly raise feed supplies in 1981 and afterward. Part of the increased feed would be used to rebuild the size and average weight of herds. Meat output too would rise—perhaps about 7 percent or about a million tons in 1981. Even with this kind of improvement, per capita meat production in 1981 would exceed the 1978 level by only 2 percent.

Other Factors Affecting Grain Embargo Impact in 1980

Our estimates of the impact of a partial US embargo on grain exports to the Soviet Union are sensitive to several key assumptions, three of which are examined below.[16] They are (a) the size of the grain diversion, (b) Moscow's decision to adjust livestock inventories in the face of reduced feed supplies, and (c) the share of the grain shortfall absorbed in meat production.

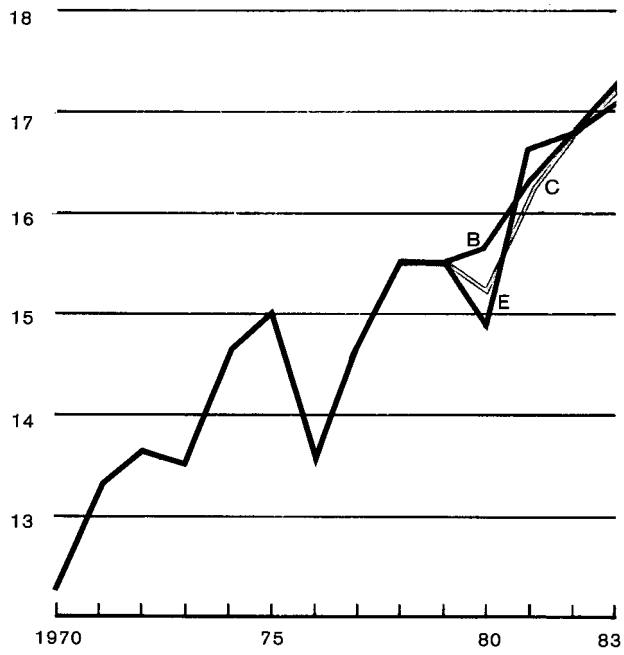
Smaller Diversion of Grain

The US export restrictions announced on 4 January deny the Soviets 17 million tons of US grain during the present LTA year ending in September. Our assumption is that continued restrictions would push this figure to about 19 million tons for calendar year 1980. The preceeding analysis was based on a diversion of 9 million tons this year and therefore a net denial of 10 million tons in 1980. Given uncertainties in the eventual course of events, diversion of grain in this calendar year could be closer to the 5-million-ton lower end of the range we now see likely. This lower diversion would require exports from Argentina, South Africa, and Thailand at the low end of the possible range and less diversion from countries party to the cooperation agreement on grain exports.

The decreased availability of imports would serve to hold feed supplies somewhat lower than otherwise and would lead to somewhat larger reductions in livestock inventories (see Case D in appendix D). The net result would be slightly lower meat output in 1980—perhaps

[16] A fourth factor which will have a large influence on meat production this year is the condition of the grain and nongrain feed harvests in 1980. Strictly speaking, though, the net impact of the US embargo, which depends upon the degree to which the Soviets can offset the loss of US grain, is independent of the size of this year's crops. The level of meat output actually reached this year, however, will depend greatly on this year's harvest. Our basic analysis assumes an average grain crop this year and for the next few years as well. Obviously the vagaries of weather in the USSR make wide fluctuations in harvest the norm. Although a succession of two crop shortfalls on the scale of 1979 would be unprecedented over the last 20 years, a below-average crop in 1980 is always a possibility. A grain crop this year of about 200 million tons—only half the shortfall from trend that occurred in 1979—would require larger than anticipated reductions in livestock herds, force meat output in 1980 down another half million tons to around 14.7 million tons, and delay the return to 1978 per capita meat production levels until 1982 or later.

Figure 7
USSR: Meat Production With No 1980 Herd Reduction[1]



Case B–Poor 1979 grain crop and full US exports
Case C–Restricted US exports in 1980–83
Case E–No 1980 herd reduction and restricted US exports

1Values for 1970–78 are historical data; those for 1979–83 are estimates. All data are given in Appendix D.

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by a hundred thousand tons to 15.1 million tons. This would in turn bring the loss in meat output under the embargo to around a half million tons or 3 percent.

Reduced Livestock Slaughter in 1980

Changes in livestock inventories in a given year reflect both feed supplies and slaughter rates. Reduced feed availability this year means that some adjustment in livestock herds is unavoidable. Soviet livestock planners must reduce animal weights and livestock numbers to bring inventories back into balance with available feed supplies. Choices made here will reflect competing concerns for the long-term performance of the livestock sector and the current output of meat. Obviously, any increase in slaughter rates will tend to improve near-term meat production compared with the level otherwise possible. Our basic meat projection for 1980 assumes a normal—in this case, sizable—downward adjustment in livestock inventories during 1980 and this tends to keep meat production from falling as far as the shift in feed availability might suggest.

Figure 6 compares this situation with one in which we assume that Moscow decided not to reduce livestock inventories during 1980. This decision would exacerbate the meat supply situation in 1980 (figure 7) by reducing the slaughter offset to lower feed rations. Meat output in this case would fall an additional several hundred thousand tons in 1980—somewhat more than a half million tons below production in 1979—although larger herds would permit a more rapid recovery in 1981. These estimates serve to highlight some of the intertwined factors undoubtedly involved in present discussions within the Soviet leadership aimed at identifying the appropriate balance between livestock and meat production policies for 1980.

Distributing the Grain Shortfall

Our basic analysis assumes that meat production absorbs the brunt of the 1980 shortfall in grain for feed created by the US embargo. This allows us to calculate the maximum potential impact of the embargo on meat production and is generally consistent with the greater stability in production of nonmeat products, primarily milk.[17] The Soviets could, however, distribute the shortfall in a different manner. If they were to allocate the drop in grain supplies for feed in a pattern roughly proportional to the shares of grain consumed on average in meat and nonmeat production, our estimate of 1980 meat production rises a couple hundred thousand tons to about 15.4 million tons, and the negative impact of the US embargo in 1980 falls to around 0.2 million tons (see Case F in appendix D).

[17] For the period 1960-78, the coefficient of variation for nonmeat livestock products was 3.1 percent, while that for meat was 5.1 percent.

How Large Could the Grain Embargo Impact Be?

The estimates that we have made of the impact of the US grain embargo assume that Moscow will import a total of 28 million tons of grain in 1980 and up to 28 million tons annually thereafter, despite restricted imports directly from the United States. These import availability estimates reflect the substantial trade restructuring that is possible—and we think likely—by this summer and most certainly after the present LTA year which ends in September 1980.

The diversion obviously serves to dilute the impact of the embargo by reducing the net import shortfall below the amount of restricted US exports. The maximum possible embargo impact would be associated with restricted US exports, minimum diversion of grain, and steady non-US origin exports to the USSR at preembargo levels. These conditions are consistent with Soviet imports of around 20 million tons in 1980—about 8 million tons below our present estimates.

Under a maximum embargo of this kind (Case G in appendix D), meat production would fall another 300,000 tons in 1980 to near 14.9 million tons. In this case, the embargo would be accounting for about a 0.7-million-ton drop in meat production. It appears then that the larger postembargo imports we now anticipate will offset somewhat less than half of the potential full embargo impact on meat production in 1980.

Prospects for Grain Embargo Offsets Through Imports of Soybeans, Soybean Meal, and Meat

The main thrust of US restrictions on the export of agricultural products to the Soviet Union is to reduce prospects for grain available for livestock feed in 1980. This is especially true for the first half of the year when most of the denied US shipments would have arrived. Moscow's initial efforts to limit the impact of lower US exports on the output of animal products have focused on replacement of at least some of the denied US shipments with grain from other sources.

There are in addition two other areas where Soviet actions could serve to offset further the impact of the US grain embargo. One is imports of soybeans and soybean meal to upgrade feed rations; the other is direct imports of meat. Assessments of the implications of possible Soviet actions in these areas are highly uncertain, however, because (a) there is little hard evidence that the Soviets intend to go further in these areas now than prior to the shift in US policy and (b) the effect of additional soybeans and soybean meal on Soviet meat production is very difficult to gauge.

Imports of Soybeans and Soybean Meal

Unlike the United States and most other Western livestock producers, the USSR has not heavily integrated the use of soybean meal into its livestock feeding. Therefore, increased use of high protein meals has the potential for substantially raising the efficiency of Soviet feeds. Prior to the US restrictions, which also embargoed US exports of soybeans and soybean meal to the USSR, there were indications that Moscow was prepared to move ahead with a program of increased use of protein meals. Given the difficulty in fully replacing denied US grain, Moscow will probably move quickly to replace the denied US soybeans and soybean meal and is likely to supplement these quantities with some additional imports.

The denied 400,000 tons of *US soybean meal* probably have already been replaced by purchases in Western Europe. In fact, sales to the USSR since the embargo may have exceeded these amounts by several hundred thousand tons. Additional soybean meal imports on this scale—even double the preembargo levels—would mean an offset of perhaps 60,000 tons of meat through increased domestic meat output.

Soybean meal is processed in Europe, partly by firms that are associated with US firms which are expected to cooperate in observing the embargo, but also by firms which have no ties to the United States. Brazil is the other major non-US supplier of *soybean meal.* Despite stated fears of contamination by African swine fever, Moscow may be willing to buy *soybean meal* from Brazil.[18] The recent visit of a Soviet veterinary to Brazil to determine if Brazilian soybean meal is free

[18] The USSR has very strict regulations concerning animal disease and possible contamination. Contamination by African swine fever was the reason give for rejection of meal in transit from Brazil in early 1979.

of contamination suggests at least a serious interest. Nonetheless, transportation and handling facilities combined with the limitations of the developing mixed feed industry preclude imports of soybean meal in excess of one million tons over the next year.

The denied US exports of *soybeans,* about 700,000 tons, can easily be replaced with soybeans from Brazil and/or Argentina, although there is as yet no confirmation of Soviet moves to do so. Because the Soviet sunflower seed crop was disappointing last year, the Soviet Union has both the capacity to process imported soybeans and the need to replace the denied US exports. Moscow may, indeed, purchase up to one million tons this year in order to utilize crushing capacity (available because of the short sunflower seed crop) and increase supplies of vegetable oil.[19] The purchases will have to come from the new crop in the southern hemisphere so imports will not be available until April/May of this year. The soybean meal from an additional 300,000 tons of soybean imports above replacement of denied US exports would add less than 40,000 tons to meat output in 1980.

Increased soybean meal supplies—from stepped-up imports and processing of imported soybeans—will, of course, assist in improving the balance of livestock feed rations and ultimately in raising meat output. The basic inefficiencies of the livestock sector combined with its lack of flexibility in adjusting feeds will, however, limit the gain.

Possibilities for Meat Imports

Although domestic meat production in calendar year 1979 remained at the 1978 level of 15.5 million tons, Moscow improved domestic supplies by importing an estimated 350,000 to 400,000 tons of meat, meat products, and poultry, about double the 184,000 tons imported in calendar year 1978. Exports probably remained at roughly 40,000 tons, the average quantity exported during 1975-78 (38.6 thousand tons in 1978).

Increased meat imports are an option open to the Soviets if they want to limit the impact of reduced domestic meat production on overall meat availability. Commitments and negotiations now point toward meat imports in calendar year 1980 at around 400,000 tons or roughly last year's level. Tight world supplies make larger imports difficult but, if Moscow is willing to pay substantial premiums, imports could approach the previous record of 617,000 tons registered in 1977.[20] An embargo offset of around 100,000 tons of meat seems likely through additional imports.

The Soviets have purchased meat, meat products, and poultry from Argentina, New Zealand, Australia, and the EC for delivery in 1980. Moscow's interest in boosting meat imports is also evident in the exploratory talks for large additional quantities with Australia and for smaller amounts with Colombia, a country from which the Soviets have not previously bought. In both cases, however, the Soviets appear to have refused the initial asking price which represented a sharp jump above earlier levels.

There is also the potential for Eastern Europe to increase meat exports to the USSR, which have averaged well over 100,000 tons in recent years. The East Europeans cannot shift a significant amount of meat intended for domestic consumption to the USSR without seriously aggravating their own consumers. They might be willing to ship some meat intended for domestic use to the Soviets for hard currency and then purchase meat for their own use on the world market. They might also divert some of the 300,000 tons or more of meat and meat products now going to non-Communist countries, especially if the Soviets paid in hard currency at prevailing world market prices.

On the whole, some relief from the impact on meat supplies of the US grain embargo is possible through direct imports of additional meat products. If the extra imports come from the West, they would entail substantial market premiums. If they come from Eastern Europe, the political implications become complex. In neither case, though, have Soviet intentions become clear.

[19] With the purchase of an additional one million tons of soybeans, total deliveries through September 1980 would come to 1.8 million tons since last fall. This quantity appears consistent with the Soviet domestic crushing capacity and the availability of oilseeds for crushing from the 1979 Soviet crop.

[20] The USSR could handle imports of at least 800,000 tons over the course of a year, perhaps more if domestic meat production is down, leaving storage capacity free.

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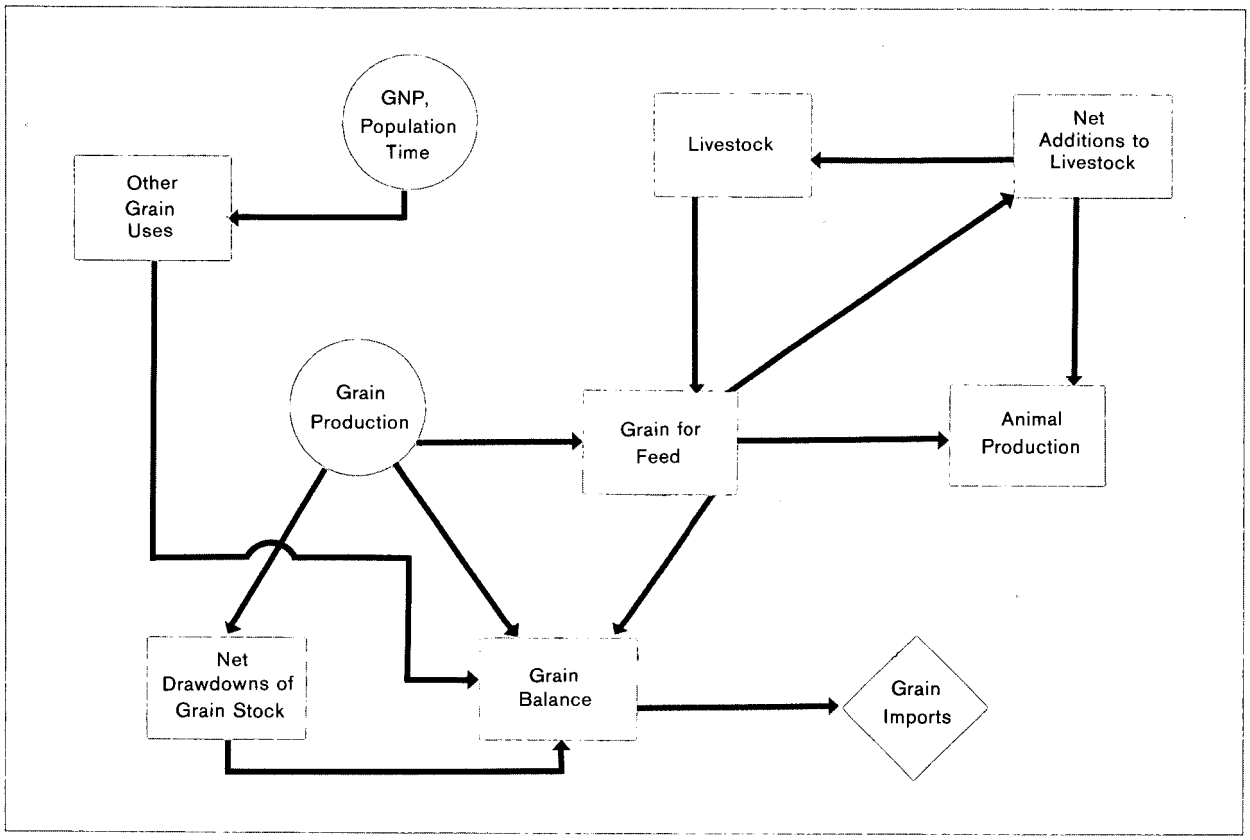
Figure A-1

OER Impact Model of Soviet Agriculture



Variables which are inputs to the model
Variables which are computed by the model
Grain imports can be either an input or calculated
Flow of calculations to project the impact of a given grain harvest
Flow of calculations to project the impact of given grain imports

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Appendix A

The OER Impact Model of Soviet Agriculture: An Overview

The estimated impacts of restricted US grain exports on the Soviet livestock sector given in this paper were derived from the OER impact model of Soviet agriculture. This model is based upon past Soviet adjustment behavior in the face of fluctuations in the availability of grain.

The model is shown schematically in figure A1. Necessary inputs are indicated by circles and information computed by rectangles; grain imports can be either computed or assumed and are separately indicated as a diamond. Given hypothetical or actual figures for grain production, population and GNP, the model can generate projections of various indicators of sector performance, including grain available for feed, livestock inventories, and meat production.[1] Two different kinds of impact calculations are possible:

Impact of a Given Harvest (Blue Lines)
In this case we are interested in the potential performance with a particular grain crop available. The grain crop together with livestock inventories determine the grain used for feed, and grain imports are computed as the balancing item in the overall grain balance.

Impact of Given Grain Imports (Brown Lines)
Here we are interested in the impact of restricted grain availability by specifying both the grain crop and the quantity of imports. This is the situation under a full or partial grain embargo. Grain used for feed is now determined by the grain balance, and livestock inventories adjust to the feed situation.

The model contains statistical equations estimated over the period 1961-78. Projections based on these estimates imply average Soviet behavior as suggested by agricultural performance during this period. They cannot be used to estimate shifts in Soviet behavior, although the same analytical framework can be used to examine the impacts of assumed changes in Soviet reaction patterns, as some of the analysis in this paper attempts to do.

There are severe limitations in much of the essential data describing the Soviet livestock sector and these limit the consistency and precision of the analysis. In addition, frequent policy shifts make it difficult to isolate reliable trends among specific variables. Nonetheless, there is enough stability in historical relationships to provide some guidance in impact analysis. This is illustrated in figure A2 where we have plotted Soviet meat production. The estimates in this figure are derived from the following equation (t-statistics are in parentheses):

$$\frac{\text{Meat}}{\text{Livestock}} = \underset{(2.0)}{-0.015} + \underset{(12.5)}{0.041}\,\frac{\text{Total Feed}}{\text{Livestock}} - \underset{(5.6)}{0.095}\,\frac{\text{Net Additions to Livestock}}{\text{Livestock}} + \underset{(2.0)}{0.008}\,\frac{(\text{Actual Grain Crop})_{-1}}{(\text{Trend Grain Crop})_{-1}}$$

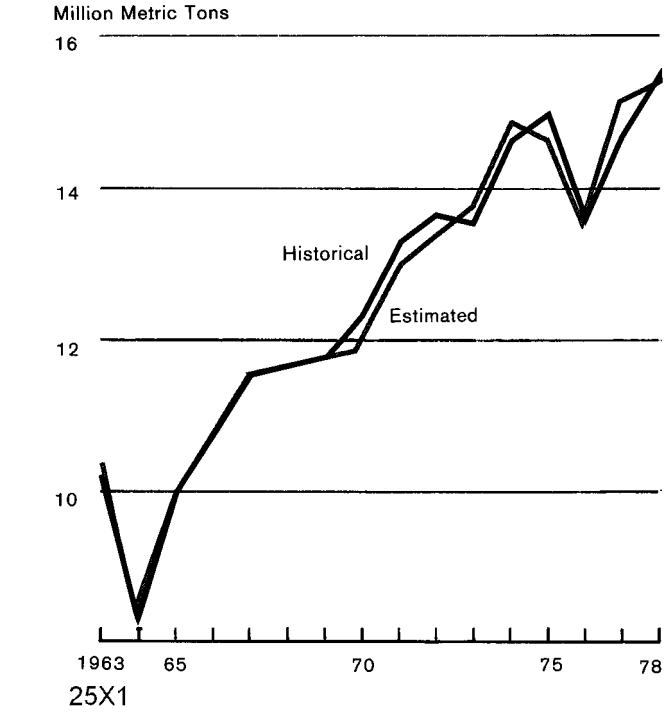
$$\bar{R}^2 = 0.94 \qquad DW = 1.70$$

The equation shows that meat production per unit of livestock has depended upon three factors: (a) a positive connection with feed availability per animal; (b) a negative connection with herd inventory adjustments since increases generally mean less slaughter and vice versa; and (c) a positive connection with the

[1] Grain accounts for about a third of total livestock feed. The quantity of nongrain feed is estimated from a historical relationship between nongrain feed, grain used for feed, and a variable reflecting the relative size of the grain harvest.

Figure A-2

USSR: Meat Production



previous grain harvest which suggests a combination of improved feed quality and higher average slaughter weights following a good grain crop and the reverse following a poor one.[2] Impact analysis in this paper combines separate projections of livestock, feed, and the grain crop to estimate meat output through this relationship.

[2] This equation indicates that meat marketed will fall 0.4 million tons (slaughter-weight) with each 10-million-tons drop in total feed supplies. Soviet feeding norms suggest a loss of 1 million tons of animal liveweight or about 0.7 million tons of slaughter-weight meat for each 10 million tons reduction in feed supplies. By implication, then, normal Soviet practices have distributed gains or losses in meat production roughly equally between liveweight inventory and actual marketings. This equation also reflects the average historical distribution of feed between the production of meat and nonmeat animal products. If a 10-million-ton change in feed supplies were concentrated solely on meat production rather than distributed between meat and nonmeat products based on historical patterns, the drop in meat output goes from 0.4 million tons to more than 0.5 million tons.

Appendix B

Estimated Grain Balances for the USSR, 1970/71 to 1979/80

This appendix provides data related to estimated grain balances for the Soviet Union. Balances through the 1977/78 crop year are based primarily upon official Soviet data. Balances for 1978/79 and 1979/80 rely heavily upon projections derived from our model of the Soviet agricultural sector, since actual figures are now available for only a few elements in these balances. Table B1 gives the estimated grain balances; table B2 shows the waste and losses discount factors associated with weather and crop size; and table B3 gives grain used for feed in both official and adjusted terms.

Table B1

Million Metric Tons

USSR: Grain Balance, 1970/71 to 1979/80 (1 July - 30 June)

	Supply				Utilization						Implied Change in Stocks [11]
	Production [1]	Waste and Losses [2]	Imports [3]	Net Supply [4]	Total [5]	Feed [6] (Adjusted)	Food [7]	Seed [8]	Industrial [9]	Export [10]	
1970/71	186.8	28.0	3.8	162.6	165.9	71.5	58.6	24.6	3.0	8.3	−3.3
1971/72	181.2	21.4	6.6	166.4	172.1	75.2	59.9	26.0	3.4	7.6	−5.8
1972/73	168.2	16.7	25.7	177.3	174.4	79.1	60.2	25.4	4.0	5.7	2.9
1973/74	222.5	36.9	14.2	199.7	180.1	82.1	59.4	26.7	4.5	7.4	19.7
1974/75	195.7	27.4	5.0	173.3	180.8	83.6	58.5	27.0	5.0	6.7	−7.5
1975/76	140.1	11.7	27.1	155.5	179.3	85.1	57.5	27.7	5.3	3.6	−23.8
1976/77	223.8	31.1	12.8	205.5	190.7	94.2	59.5	28.0	5.5	3.5	14.8
1977/78	195.7	29.3	19.5	186.0	198.6	100.2	61.0	27.7	5.5	4.2	−12.7
1978/79 [12]	237.2	31.5	17.4	223.1	212.9	113.0	62.8	27.5	5.6	4.0	10.2
1979/80 [12]	179.0	20.1	34.0	192.9	208.3	107.6	63.2	27.5	6.0	4.0	−15.4

[1] Official production statistics from *Narodnoye khozyaystvo SSSR v 1978 g.* and earlier years.

[2] Percentage waste and loss figures are applied to official production statistics to derive the waste content of the crop. The total also includes a 3-percent deduction from grain imports to account for handling and transportation losses.

[3] Official statistics on all grain, flour, and rice imported, including that purchased by the USSR for client states. Flour and rice are converted to grain equivalent. See CIA/A (ER) 75-68, *The Soviet Grain Balance 1960-73,* September 1975, p. 30. The figure for 1979/80 includes roughly 19 million tons purchased July/December 1979 and assumed January/June 1980 purchases of 3 million tons from the US and about 12 million tons from non-US sources. The total includes about 3 million tons of grain and flour purchased for client states.

[4] Production less waste and losses plus imports. See A (ER) 75-68, pp. 18-21. Totals calculated from unrounded data.

[5] Sum of grain used for feed, food, seed, industrial purposes, and export. Totals calculated from unrounded data.

[6] Official feed statistics are adjusted to exclude waste and losses. See table B3.

[7] Based on official statistics on flour and groat production converted to grain equivalent, using official data on extraction rates. See A (ER) 75-68, pp. 30-31. Extraction rates apply to clean grain, net of waste.

[8] Based on official data on area sown to each grain and on seeding rates by oblast for the RSFSR, Belorussia, and Moldavia. See A (ER) 75-68, p. 30. Seeding rates refer to clean grain.

[9] Recent information on quantities of grain used in alcohol production dictated an upward revision in the industrial use series since 1971 shown in A (ER) 75-68, p. 24. Otherwise the series (and methodologies) have not changed. The latest source of data is Kochubeyeva, M.T., *Ekonomika, organizatsiya, i planirovaniya spirtovogo i likerno-vodochnogo proizvodstva,* Moscow, 1977. Quantities shown in this column are also net of waste.

[10] Official data on all grain, flour, and groats exported including that to client states. Flour and rice are converted to grain equivalent. See A (ER) 75-68, p. 32. Exports are assumed to be net of waste although evidence suggests exports of domestically produced grain are occasionally of low quality.

[11] Total supply less total utilization. Calculated from unrounded data. This series runs roughly to zero for the 1960s and 1970s, but shows a net withdrawal over the last decade.

[12] Balances for 1978/79 and 1979/80 include projections based on our model of the Soviet agricultural sector. The projections reflect import assumptions in note (3).

Table B2 Percent

Waste and Losses [1]

	Associated With Weather [2]	Associated With Crop Size [3]
1971/72	11.0	0.6
1972/73	9.6	−0.3
1973/74	14.4	2.2
1974/75	13.6	0.2
1975/76	9.0	−1.3
1976/77	13.0	0.5
1977/78	15.0	−0.6
1978/79	12.2	0.6
1979/80	11.8	−0.8

[1] The two-stage discount is an improvement on our most recent estimates published in CIA ER 79-10057, *USSR: Long-Term Outlook for Grain Imports,* January, 1979, p. 15.

[2] The weather-related allowance for grain waste is based on the premise that the level of waste varies directly with the amount of precipitation immediately before and during the harvest. For each year, the harvests of spring grain and winter grain are categorized as very wet, wet, normal, dry, or very dry according to the average number of millimeters of rainfall received as follows:

	Spring Wheat	Winter Wheat
Very wet	Over 45.8	Over 76.3
Wet	40.5 - 45.7	65.3 - 76.2
Normal	35.3 - 40.4	53.8 - 65.2
Dry	29.6 - 35.2	42.3 - 53.7
Very dry	Below 29.5	Below 42.2

Each moisture level, in turn, is equated with a percentage grain discount. A discount of 11 percent is adopted for years of normal precipitation. (See ER 75-68, pp. 14, 18.) We arbitrarily raise this figure to 13 percent for wet years and to 15 percent for very wet years. In the other direction, 11 percent is lowered to 9 percent for dry years and to 7 percent for very dry conditions. The discounts for winter grains are weighted together using 30 percent for winter grains and 70 percent for spring grains. These weights approximate the distribution of sown area.

[3] When a large grain crop coincides with rainy weather at harvest time as in 1976, losses due to the shortage of combines, transportation, cleaning, drying, and storage facilities are larger than in years with small harvests and dry weather, such as 1975. On average, moreover, growth in gross grain output has outstripped growth in farm capacity to clean and dry the crop immediately after harvesting. During 1971-75, capacity was adequate for about 75 percent of the harvest; during 1976-78 this share fell to 66 percent. In addition, Soviet data show a decline in seed quality that we believe is related to the difficulty in cleaning and drying the very large harvests of recent years. While 84 percent of spring grain seed from the 1977 harvest of 195.7 million tons met standards for top quality, only 71 percent of seed from the record 1978 harvest fell into the top categories *(Planovoye khozyaystvo,* no. 3, 1979, pp. 31-40). We thus apply a crude adjustment to the moisture-based percentage which is derived from a ratio of the size of the crop to the crop that would have resulted under average conditions (trend). We arbitrarily assume the adjustment is 0.5 of the ratio.

Table B3 Million Metric Tons

Grain Used for Feed [1]

	Based on Official Statistics [2]	Adjusted [3]
1971/72	92.7	75.2
1972/73	96.9	79.1
1973/74	106.3	82.1
1974/75	104.4	83.6
1975/76	100.7	85.1
1976/77	115.3	94.2
1977/78	124.4	100.2
1978/79	134.2	113.0
1979/80	126.6	107.6

[1] Grain used for feed is derived from the official series on concentrates fed to livestock, with an adjustment for waste. Because the most recent statistics available are for 1978, the 1978/79 and 1979/80 quantities are derived from projections using our model. The projections reflect the import assumptions in table B1.

[2] Nongrain components of concentrate feed (oilseed meal, milling byproducts, alfalfa meal) are subtracted from the published total to derive grain fed to livestock. (See A (ER) 75-68, pp. 33-34.) Crop year quantities of grain fed are derived according to the standard convention—one-third of grain used for feed in the current year comes from the current crop, two-thirds comes from the crop of the previous year.

[3] Feed must be reduced by waste and losses to be comparable with other grain uses shown in the grain balance table. We assume that 80 percent of total waste and losses are included in official feed statistics. This share reflects in particular the higher-than-average storage losses associated with grain used for feed, and was found to yield reasonable net feed and implied stock change series. The remaining 20 percent is implicitly excluded from the other uses, all of which are given on a standard grain basis. Because grain fed in any calendar year comes from two crops, the waste and losses associated with that feed must also depend on two crops. Thus, 80 percent of waste in last year's crop is allocated one-third to last year's feed and two-thirds to this year's feed. Eighty percent of waste in the present year's crop is allocated one-third to this year's feed and two-thirds to next year's feed.

Appendix C

Collateral Information on 1978 and 1979 Feed Production

We believe the impact in 1980 of the grain shortfall could be even more pronounced than the model indicates. During 1978/79, the USSR was sharply affected by two sets of weather conditions that forced an increase in the share of grain being fed in the ration and thus a shift in feeding patterns. The first set of conditions involved the northwest areas of the country in the fall of 1978, the second struck hardest at the Volga Valley, the eastern Ukraine, and Belorussia in the spring of 1979. Our rough incorporation of the spillover of these factors into 1980 is more likely to underestimate than to overestimate their effect on feed availability this year. Consequently, the feed situation in 1980, especially during the early months, could be worse than our basic analysis reflects.

In the fall of 1978, the Baltic Republics, Belorussia, and the northwest and central regions of the RSFSR were hit with unusually cool weather and excessive moisture conditions. As a result, production of feed crops including grain and hay and other forage crops, was down. Latvia's grain crop was off by 30 percent from the average of the preceding four years and Estonia's was down 25 percent. Although these areas are not major grain producers, accounting for about 10 percent of total grain production, the consequences of the shortfall on the livestock sector could have been severe. Under Khrushchev, the region, particularly the Baltic Republics and Belorussia, was directed to emphasize the livestock sector. By the late 1960s, this section of the country was feeding about 20 percent of all concentrates fed.

The precariousness of the livestock situation was spelled out graphically in the speeches late last year by leaders of the Baltic Republics and Belorussia at the 28-30 November USSR Supreme Soviet session and at mid-December Republic Central Committee plenums. These speeches make it clear that Moscow had to move large amounts of grain to this region to save the livestock herds during the winter of 1978/79. Moreover, weather problems continued into the summer and fall of 1979 and led to requests for more feed for the winter of 1979/80.

The speeches by deputies from the Baltic Republics and Belorussia at the USSR Supreme Soviet session vividly described the difficulties in saving the livestock herds during 1978/79. The sensitivity of these descriptions was highlighted by their almost total excision from the deputies' speeches printed in *Izvestiya* and other central papers and their appearance only in the local press versions.

The Belorussian First Deputy Premier in charge of agriculture, V. A. Gvozdev, not only described the near disaster in 1979 but ended by asking for more feed from Moscow for the 1979/80 winter. According to the 1 December *Sovetskaya Belorussiya* account, he stated that "literally the whole people in the republic" had been mobilized to scour the "forests, swamps and other nonfarm land" for enough fodder to preserve the herds. A "huge number of workers" were drawn out of factories, he related, and the herds had been saved. "Our task now is to stop the fall in production of livestock products" and "make up for the shortfall of milk and meat which occurred during the dry spring-summer period" and, he added, "here we are hoping also for the help of union organs in making additional allocations of concentrates." In the *Izvestiya* version, he only acknowledged that the year had been "unusually complicated" and that "great assistance" from factory workers and All-Union ministries had been necessary to overcome "damage caused by the elements."

In his report to the Belorussian party plenum in December, Party Secretary P. M. Masherov admitted the forage crop deficit was not made up although the

Republic had been able to "preserve the planned number of cattle," thus implying additional quantities of grain were fed. In his February election speech, Masherov went even further, stating that the 1979 drought had threatened to create an "almost full lack of livestock products for sale to the public."

Lithuanian Agriculture Secretary R. I. Songayla pressed for reduction of Lithuania's quota for delivering meat to USSR stocks. According to the 1 December *Sovetskaya Litva* (and also the 1 December *Izvestiya*), he stated that because of the "exceptionally difficult situation" caused by bad weather in 1978 and 1979, Lithuania will have only 72 percent of its feed needs for the winter, even including "state resources." This, he said, means it will be impossible for Lithuania to fulfill 1980 plans for supplying meat for its own people and for delivering meat to the All-Union meat fund, and "therefore, we ask the USSR Council of Ministers to consider once again our request to tie these plans to the available resources of feed."

Estonian leaders focused on the severity of the 1979 feed shortage and on their dependence on aid from Moscow. Estonian First Secretary K. G. Vayno, according to the 30 November *Sovetskaya Estoniya*, stated that "after such a natural disaster" as occurred in the fall and winter of 1978, it "usually takes two to three years to restore the productivity of livestock," but because of the "great help" from Moscow—grain from "Russia, the Ukraine, and Kazakhstan"—"we managed to preserve the livestock herds." The 30 November *Izvestiya* only included his statements that livestock raisers were working intently to end the drop in livestock productivity caused by the "difficult fall and winter" of 1978 and had "managed to preserve the livestock herds."

Estonian Premier V. I. Klauson, according to the 1 December *Sovetskaya Estoniya*, stated that Estonia's agriculture in 1978 had "suffered a real natural disaster . . . as a result of which we gathered about half the normal year's harvest of grain, potatoes, and fodder." As "the weight, milk yield, and mating of animals began to drop sharply," he said, "the question arose of significantly cutting the livestock herds to avert forced losses from lack of feed." If this had continued, it would have taken "several years to restore the livestock herds and the output of livestock products," he declared, but because Moscow had rendered "huge assistance by allocating feed from central resources, . . . we were able to normalize the livestock situation." The 2 December *Izvestiya* only included his admission that "unfortunately, the present year also was not successful for the republic's agriculture."

Statements earlier in 1979 had detailed the Estonian drain on Soviet grain and the cuts in meat deliveries. In a speech reported in the 22 February 1979 *Sovetskaya Estoniya*, First Secretary Vayno described Estonia's feed harvest in 1978 as so small that Moscow had had to send 490,000 tons of grain—almost equal to Estonia's entire normal harvest—to Estonia to get its livestock herds through the winter of 1978/79.

The number of livestock dropped somewhat during the winter despite this aid, and Estonians began to blame continuing local meat shortages on shipments of Estonian meat to Moscow. Implicitly recognizing this, a 21 March 1979 *Sovetskaya Estoniya* article stated that "some people" wrongly thought that Estonia was shipping "large quantities of meat to the All-Union fund" but that in fact Estonia's quota for export of meat had actually been cut 22 percent in the first quarter of 1979.

The representative of the third Baltic Republic—Latvia—made no revealing statements in his Supreme Soviet speech, but Latvian First Secretary Voss in a 20 November local speech to livestock raisers had similarly spoken of the "natural disaster" of 1978 and "difficulties" of mid-1979 and had indicated that Latvia had received "great aid" in the form of "concentrated feed" from Moscow.

The second set of conditions in late spring 1979 cut pasture and forage crop availability dramatically. From mid-May through early June a stationary high-pressure system near the Ural Mountains not only caused below-normal rainfall from Moscow to Kustanay but produced a classic *sukhovey*.[1] Hot, dry air was drawn from the Kara Kum desert into the

[1] *Sukhovey:* sustained, hot, dry wind.

Volga Valley, the northern Caucasus, and the eastern Ukraine. As the system intensified, temperatures in some areas reached 34 degrees Celsius (93°F) and winds reached speeds as high as 24 knots.

Dry weather continued in much of the European USSR during late June and early July. Areas which had already been damaged by the *sukhovey* were again subjected to hot, dry winds on two occasions—14 to 17 and 21 to 23 June. The area affected by drought encompassed the central Ukraine, most of the Central Black Earth region, and most of the Central Region of the RSFSR as well.

The *sukhoveys* and drought occurred during the period when vegetative growth of forage grasses is usually rapid. Consequently, hay and grasses were stunted and matured early. Concern with the magnitude of the feeding problem was evident in the flow of press articles calling for harvest and preservation of all available sources of forage. Members of the US Department of Agriculture Winter Wheat Team saw farmers making extraordinary efforts to save the straw and chaff from harvested grain fields. They also saw grasses along roadways being cut for feed. Short supplies of forage crops throughout the drought-affected area undoubtedly also forced the feeding of larger-than-usual quantities of grain. In average years, the livestock sector in this area consumes roughly 45 percent of total concentrates. We believe even more grain than usual was fed during the late spring and early summer of 1979 to compensate for the shortfall in forage availabilities. The few productivity indicators available for this area suggest a profile similar to that of the areas not affected by drought.

Hypothetical calculations, based on feeding rates implicit in the model, suggest that if usual concentrate feed rations were bolstered by, say, 20 percent in the two areas affected during the periods of stress, the quantity of grain required would have jumped by 5 million to 6 million tons above the quantity projected in the model for 1978/79. This could make it difficult to sustain the rates of withdrawals from grain stocks we project for 1979/80.

Appendix D

Tabulations of Historical Data and Impact Projections

Table D1

Historical Data

	1970	1971	1972	1973	1974	1975	1976	1977	1978
Grain imports (million metric tons)	3.0	4.2	15.8	24.0	7.8	16.3	19.7	10.5	21.7
Grain for feed (million metric tons) [1]	69.2	72.6	76.5	80.4	82.9	83.9	85.7	98.5	105.8
Livestock (million units) [2]	115.1	123.1	127.2	127.1	131.1	134.9	130.1	132.4	138.1
Meat production (million metric tons)	12.3	13.3	13.6	13.5	14.6	15.0	13.6	14.7	15.5
Meat production per capita (kilograms)	50.6	54.2	55.1	54.2	58.0	58.8	53.0	56.8	59.3

[1] Grain used for feed is derived from the official series on concentrates fed to livestock, with an adjustment for waste. See appendix B, table B3.
[2] Animal herds are measured as of 1 January in terms of cow equivalents. Animals are aggregated based on relative feeding rates.

Table D2

Projections for Case A [1]

	1979	1980	1981	1982	1983
Grain imports (million metric tons)	14.3	24.7	26.7	29.2	32.2
Grain for feed (million metric tons)	113.8	114.7	119.3	124.5	130.5
Livestock (million units) [2]	141.6	143.5	143.0	143.3	144.9
Meat production (million metric tons)	16.7	16.5	16.6	16.8	17.2
Meat production per capita (kilograms)	63.1	61.9	61.7	62.0	62.8

[1] Case A—Reference case with 1979 grain crop on plan.
[2] Animal herds are measured as of 1 January in terms of cow equivalents. Animals are aggregated based on relative feeding rates.

Table D3

Projections for Case B [1]

	1979	1980	1981	1982	1983
Grain imports (million metric tons)	30.3	38.0	25.3	29.5	32.8
Grain for feed (million metric tons)	116.6	111.5	117.8	124.9	131.0
Livestock (million units) [2]	141.6	143.4	141.0	142.5	145.1
Meat production (million metric tons)	15.5	15.6	16.3	16.8	17.3
Meat production per capita (kilograms)	58.8	58.7	60.7	61.8	63.0

[1] Case B—Poor 1979 grain crop and full US exports.
[2] Animal herds are measured as of 1 January in terms of cow equivalents. Animals are aggregated based on relative feeding rates.

Table D4

Projections for Case C [1]

	1979	1980	1981	1982	1983
Grain imports (million metric tons)	30.3	28.0	24.8	28.0	28.0
Grain for feed (million metric tons)	116.6	103.1	117.4	123.9	127.5
Livestock (million units)[2]	141.6	143.4	140.2	142.2	145.0
Meat production (million metric tons)	15.5	15.2	16.2	16.7	17.2
Meat production per capita (kilograms)	58.8	57.2	60.3	61.7	62.7

[1] Case C—Restricted US imports in 1980-83.
[2] Animal herds are measured as of 1 January in terms of cow equivalents. Animals are aggregated based on relative feeding rates.

Table D5

Projections for Cases D, E, F, and G [1]

	1979	1980	1981	1982	1983
Case D					
Livestock (million units) [2]	141.6	143.4	139.9	142.1	145.0
Meat production (million metric tons)	15.5	15.1	16.2	16.7	17.2
Case E					
Livestock (million units) [2]	141.6	143.4	143.4	143.4	144.7
Meat production (million metric tons)	15.5	14.9	16.6	16.8	17.1
Case F					
Livestock (million units) [2]	141.6	143.4	140.2	142.2	145.0
Meat production (million metric tons)	15.5	15.4	16.2	16.7	17.2
Case G					
Livestock (million units) [2]	141.6	143.4	139.6	142.0	145.0
Meat production (million metric tons)	15.5	14.9	16.1	16.7	17.2

[1] Case D: Low diversion of grain to the USSR in 1980.
Case E: No 1980 herd reduction.
Case F: Feed deficit is shared on a proportional basis between meat and nonmeat production.
Case G: Minimum diversion of grain to the USSR in 1980.
[2] Animal herds are measured as of 1 January in terms of cow equivalents. Animals are aggregated based on relative feeding rates.

Appendix E

Importance of the Livestock Program

The current leadership has a long and well-documented commitment both to agricultural self-sufficiency and to an improvement of consumer welfare. They want in particular to upgrade the diet through expanded meat production. Although growth rates in investment and in the flow to agriculture of industrially produced materials such as fertilizer have not always reached planned targets, the resouces allocated to this program have been impressive. The sector has responded with major increases in production of grain, meat, and other commodities. Nonetheless, the rate of progress by the farm sector has not kept up with demand. As a result, the effort to steadily improve dietary quality has required large imports of grain and other farm products in recent years.

Meat production, the key to the program, grew steadily during the first half of the 1970s but dropped sharply in 1976 as a result of the disastrous 1975 grain crop shortfall. Both massive grain imports in the next few years and better crops combined to rebuild meat production. By 1978 output had exceeded the 1975 record. In 1979, however, production remained at the 1978 level.

For the entire period since 1975 there have been reports of unusual shortages at retail level in both urban and rural areas. Moreover, reports of rationing and of meat being for sale only through places of work (not retail stores) have been increasing. The rising level of complaints over meat shortages suggests growing consumer frustration.

The 1980 election speeches of Soviet leaders revealed a widespread concern about the food situation. The sharpest talk about meat shortages came from Belorussian First Secretary Masherov who said the Belorussian Central Committee has been receiving letters "expressing anxiety over shortcomings in supplies of livestock products for the city population." Uzbek First Secretary Rashidov admitted that Uzbekistan "continues to have difficulties in supplying its population with meat and milk products." Party Secretary Brezhnev, himself, noted "there are still difficulties with some foodstuffs."

Meat Outlook for 1980

The expected decline in meat production in 1980, a consequence of the 1979 shortfall in grain production and restricted US exports, is sure to add to consumer disappointment. Moscow can partially mitigate the supply situation by importing meat. Imports of meat in 1979 are estimated at roughly 350 to 400 thousand tons, and were expected to be about the same level in 1980. Moscow could, however, choose to pay premium prices and pull meat from traditional trade flows. The countries of Eastern Europe which do export meat to the USSR are faced with short supplies this year as well, and are not likely to be able to add substantial quantities to the usual level of Moscow's imports unless they forgo their traditional markets. (We assume the Kremlin would choose not to pressure these countries so far as to cause domestic problems for their respective leaders.)

At best, meat output in 1980 will still be well below the planned target of 17.3 million tons. Our current estimate is around 15 million tons; if Moscow shifts certain policies some further offsets are possible. Even had Moscow been able to achieve the original goal, consumer frustration over meat shortages would have continued because of current policies toward personal income and retail prices—regular increases in income and stable prices—that serve to encourage an evergrowing demand.

The evidence suggests a Soviet income elasticity of demand for unprocessed meat on the order of 1.0, considerably above the income elasticity of demand estimated for other countries with comparable levels of economic development. Italy and Spain, for example, have estimated income elasticities of demand of 0.71 and 0.67, respectively. The estimated income elasticity of demand for meat in Eastern Europe—Poland (0.7),

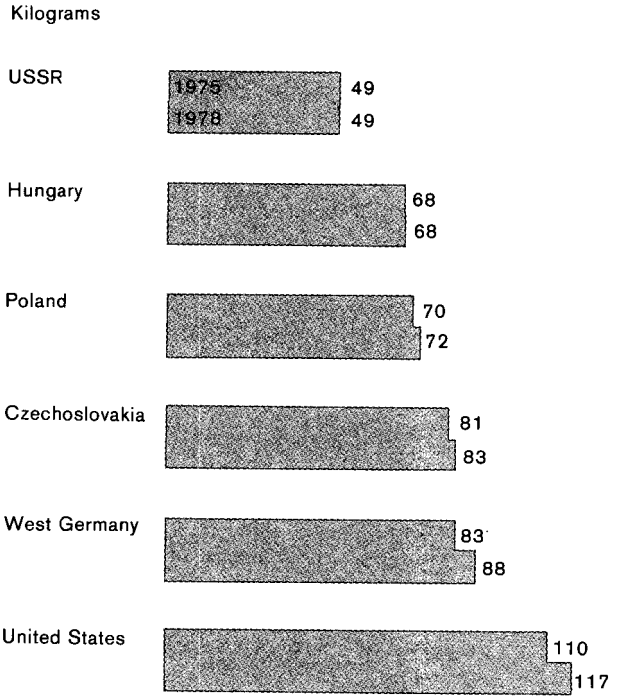
Hungary (0.65), and Czechoslovakia (0.47)—is also below that for the USSR. In the United States, income elasticity of demand for meat is estimated at 0.24.

The high income elasticity of demand for meat in the USSR is due to several factors. Per capita meat consumption is well below levels of consumption for Eastern Europe, to say nothing of the United States (see figure E1). The consumer has few alternative outlets for his rising discretionary income. Quality consumer goods such as consumer durables, clothing, and shoes are in short supply, and housing space is rationed at heavily subsidized prices. An additional reason for the continuation of the large difference between supply and demand for meat is the official policy of maintaining retail prices at relatively low levels in state retail outlets, through use of state budget subsidies. During the present five-year plan (1976-80), for example, the state budget has allocated 100 billion rubles to cover the difference between state purchase prices for meat and milk and the retail prices fixed by the state. This is roughly equivalent to four times the total agricultural investment in 1975 or 1.2 times agriculture's contribution to gross national product in 1978.

Some excess demand finds expression in collective farm markets (CFMs), where prices are relatively free to respond to supply and demand. For example, in Moscow CFMs, the average, weighted, seasonally adjusted meat price, which includes beef, pork, pork fat, veal, and mutton, has risen by 40 percent in the past five years. Beef and pork prices in mid-1979 were 2 and a half to 3 times the state retail level. Although CFMs account for less than 5 percent of all food sold, they are an important source of perishable foods for urban residents.

Figure E-1

Per Capita Meat Consumption[1]



[1]Comparable basis, includes red meat, poultry, and edible offals.

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25X1

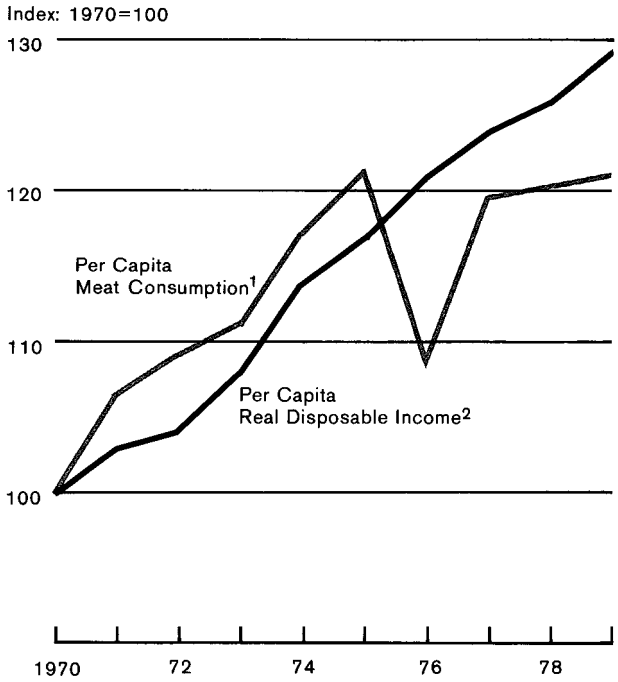
The Growing Gap Between Supply and Demand

Growth in disposable income has outpaced growth in meat consumption in recent years.[1] Assuming an income elasticity of demand of 1.0 and a continuation of the current policy of maintaining stable prices in state retail stores, a hypothetical calculation based on planned growth in personal disposable income and on planned meat production during the tenth five-year plan period indicates that the gap between supply and demand for domestically produced meat in 1980 would be 8 percent greater than that in 1975. If the gap were zero in 1975 and the planned production for 1980 were achieved, supplies in 1980 would be roughly 1 and a half million tons short of demand. Because meat output will fall far short of plan this year, while income growth has consistently exceeded the plan despite serious efforts to restrain it, the gap will be even larger.

In summary, the consequences of the 1979 grain shortfall compounded by the US denial of grain—particularly of corn which is needed to upgrade feed rations—are more serious for the leadership than smaller meat supplies. The failure to deliver on

[1] Consumption is derived by subtracting slaughter fats from the official production statistics for meat (which, by Soviet definition include them) and adjusting for net trade and inventory change.

Figure E-2
USSR: Meat Consumption and Real Disposable Income



[1] Per capita consumption of meat is derived by 1) adjusting meat production statistics to exclude slaughter fats and trim; 2) adjusting the resulting quantity for inventory change and net trade; and 3) dividing by the midyear population. Because the USSR stopped publishing detailed inventory statistics in 1975, inventory changes are assumed constant during 1976–79.

[2] Real disposable income (RDI) is the sum of total personal money income less deductions for taxes, state loans, trade union dues, party membership dues, and insurance premiums deflated by a price index that is implicit in a comparison of indexes of goods sold in the retail trade network in constant and in current prices. (See Joint Economic Committee, *Soviet Economy in a New Perspective*, Washington, D.C., 1976, pp. 631, 652–660.) Per capita RDI is derived by dividing RDI by the midyear population.

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25X1

promises of a better diet has potential for dampening work incentives and thus reducing achievement of productivity goals. It is largely through productivity goals that planners hope to achieve economic growth in the 1980s. Making meat available only through places of work would provide incentive for those workers, but failure to keep supplies up in retail outlets would reflect a decided failure for the leadership.